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1962 annual report

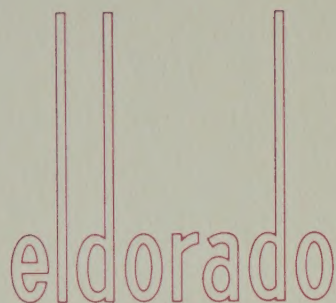
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eldorado

mining and refining
limited-and subsidiaries



mining and refining limited

Directors

W. J. Bennett	*Gordon Lawson
*W. M. Gilchrist	J. E. Sydie
F. R. Hadley	W. G. Thompson
*W. F. James	

*Members of Executive Committee

Officers

President . . . W. M. Gilchrist

Vice-President, Mining and Exploration . . .
H. E. Lake

Vice-President, Refining . . . J. C. Burger

Vice-President, Administration and Finance . . .
D. G. Scott

Secretary . . . R. C. Powell

Treasurer . . . J. C. Orr

Managers . . .

Beaverlodge Operation: J. M. Douglas

Refinery: R. M. Berry

Research and Development: A. Thunaes

Ore Procurement: R. E. Barrett

Head Office

150 Kent Street, Ottawa, Canada

Postal Address: P.O. Box 379, Ottawa, Canada

General Administration Office, Port Hope, Ontario

District Offices

Refining and Sales: Port Hope, Ontario.

Metallurgical Laboratories: Tunney's Pasture,
Ottawa, Canada.

Vice-President, Mining and Exploration:
10040-105th Street, Edmonton, Alberta.

Western Purchasing and Employment Office:
10040-105th Street, Edmonton, Alberta.

Beaverlodge Mine: Eldorado, Saskatchewan.

ELDORADO AVIATION Limited

HEAD OFFICE: 150 Kent Street,
Ottawa, Canada.

Directors

W. J. Bennett

A. B. Caywood

W. M. Gilchrist

H. E. Lake

P. L. P. Macdonnell

Officers

President . . . A. B. Caywood

Secretary . . . R. C. Powell

Treasurer . . . J. C. Orr

OPERATIONS OFFICE: No. 11 Hangar,
Municipal Airport,
Edmonton, Alberta.

NORTHERN TRANSPORTATION COMPANY Limited

HEAD OFFICE: 150 Kent Street,
Ottawa, Canada.

Directors

W. J. Bennett

A. B. Caywood

W. M. Gilchrist

W. B. Hunter

H. E. Lake

P. L. P. Macdonnell

Officers

President . . . W. M. Gilchrist

Vice-President . . . H. E. Lake

General Manager . . . W. B. Hunter

Secretary . . . R. C. Powell

Treasurer . . . J. C. Orr

OPERATIONS OFFICE: 10040 - 105th Street,
Edmonton, Alberta.

1962 ANNUAL REPORT

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mining and refining limited

and subsidiaries

ELDORADO AVIATION LIMITED

NORTHERN TRANSPORTATION COMPANY LIMITED

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President's Letter

Senator the Honourable M. W. McCutcheon,
Minister of Trade and Commerce,
Ottawa, Canada.

Sir:

On behalf of the Board of Directors and in accordance with Section 85(3) of The Financial Administration Act, I have the honour to submit the Annual Report of Eldorado Mining and Refining Limited and its subsidiary companies, Eldorado Aviation Limited and Northern Transportation Company Limited, for the year ended December 31, 1962.

The production of uranium in Canada in 1962 dropped in quantity and in value to the lowest levels since 1957. Total sales by the industry were 17,080,037 pounds of uranium oxides valued at \$173,682,395, as against 19,270,884 pounds valued at \$202,330,734 in 1961. In the peak year 1959 Canadian uranium production reached 30,996,065 pounds, with a value of \$325,328,282.

Sales of uranium oxides by Eldorado Mining and Refining Limited, included in the foregoing totals, were 2,136,322 pounds valued at \$21,718,388 in 1962, comparing with 2,416,495 pounds and \$24,786,036 in 1961, and 3,024,272 pounds and \$29,998,052 in 1959. The net income of Eldorado Mining and Refining Limited in 1962 was \$4,210,354, as against \$2,212,660 in 1961; \$3,474,259 in 1960, and \$4,134,401 in 1959.

The reduction in output both of the industry and of the Company continues the trend which began in November, 1959, when a programme was initiated to prolong deliveries under contracts with the United States Atomic Energy Commission and the United Kingdom Atomic Energy Authority. Had it not been for the stretch-out plan, all Canadian production under these contracts would have been completed by March 31, 1963.

Canada's uranium industry was given a new lease on life with the successful conclusion in 1962 of a new contract to supply 24,000,000 pounds of uranium to the United Kingdom Atomic Energy Authority. The agreement between Eldorado Mining and Refining Limited, as agent for the Government of Canada, and the United Kingdom Atomic Energy Authority, acting for the United Kingdom Government, was signed in July, after more than a year of negotiation. It was not until the end of 1962 that final details were ironed out with the producing companies.

The U.K. order will bring an estimated \$122,000,000 into the Canadian economy. In effect, it extended the working life of the mines in production as of July 31, 1961, by an average of 16 to 17 months. It is not, however, a complete answer to the problems of the industry, nor does it provide more than relatively short-term assistance to the companies, the workers and the communities involved. Although 24,000,000 pounds of uranium is a substantial amount by current standards, it is slightly less than the industry produced in 1960 and 7,000,000 pounds short of the industry's output in the peak year 1959.

The chief motive in the minds of both Canadian and U.K. negotiators was the preservation of an active, efficient and economically sound uranium industry in Canada for as long as possible. With this end in view, provision was made in the agreement for price incentives to encourage deferment of deliveries over an extended period.

The poundage was allocated equitably among the seven producers, each receiving a share proportional to contractual delivery rates as of July 1, 1961. No deliveries under the new contract will be accepted from a company until it has completed deliveries under previous contracts.

The price paid for Canadian uranium under prior agreements was intended to include adequate reimbursement to producers for capital expenditures on production facilities. As a result, facilities of the various companies should be written off before production is begun on the new United Kingdom order, so the price set in the new agreements relates solely to operating costs, using an appraisal of costs in the first six months of 1961 as the basis. While the price per pound varies among the companies, the profit per pound is virtually the same.

The average price to be paid to the producers is \$5.03 per pound and, in addition to the premium for deferment of deliveries, an escalation clause is included in the contract to take care of possible increases in basic cost levels. A modest allowance is made to cover carrying

charges incurred by Eldorado Mining and Refining Limited in financing the deferred delivery plan.

There is now reasonable certainty that one major producer, Rio Algom Mines Limited, will be able to continue operations on a stretched-out basis until the end of 1971. The Beaverlodge mine of Eldorado can operate at its present rate of 150,000 pounds of U_3O_8 monthly until the first quarter of 1967. The five other producers are scheduled to complete their deliveries at varying dates between now and the Summer of 1965. While the unexpected could happen, there is certainly nothing in view at this time which could change the short-term picture to any significant degree.

The situation currently facing the industry in Canada is common to all uranium producing countries of the Free World. There is an over-supply of uranium. Mines cannot produce indefinitely unless their production can be sold. The same thing has happened many times in other sections of the mining industry, although perhaps not on such a spectacular scale.

The biggest customer for our uranium has been the United States. Purchases by that country in the late 1950's were responsible for our uranium boom and a bonanza of more than \$1.5 billion for the Canadian economy. Current United States needs are such that they can be met with ease out of domestic production and, in fact, a stretch-out programme has been initiated for U.S. producers to keep the industry in that country alive through the lean years ahead.

The short-term outlook for the Canadian industry is one of diminishing production and a gradual shut-down of most of the mines. On the other hand, the longer range prospect has been brightened somewhat by additional evidence during 1962 that a major upturn in the demand for uranium may be expected in the late 1960's or early 1970's. Support for this view was contained in a report made last November to the President of the United States by the U.S. Atomic Energy Commission.

Great strides have been, and are being made in the entire field of nuclear generation of electricity. The extent of this progress is almost unbelievable, when it is recalled that the first nuclear reactor went into operation only a little more than 20 years ago and that already there are more than 500 of various types throughout the world. Many others are in the planning and construction stages.

Nuclear power is steadily being made more attractive, especially in areas of the world lacking in hydro resources and wholly dependent upon fossil fuels, by new developments and technologies which reduce both capital and operating costs of nuclear reactors. The cost of nuclear energy is coming more and more into line with that generated from fossil fuels. There is clear promise of growing markets for uranium fuel in the years to come, and many analysts in Canada and abroad have made upward revisions in their estimates of the potential market from 1970 onwards. The experts believe that while needs for uranium for military purposes will continue to diminish, there will be an off-setting steady rise in demand for non-military uses.

If Canada is to compete successfully in the new markets for uranium, it is vital that its industry be kept alive, up-to-date in its production and cost control techniques, and alert to its opportunities. The industry is much too valuable as a national asset to be permitted to disintegrate because of a purely temporary situation. By the time existing contracts have been completed, the industry will have brought about \$1.7 billions into the Canadian economy, a substantial share of which has gone to

the Government either directly from the operation of Eldorado, or indirectly from taxes paid by Eldorado and other producers.

The poundage under the new United Kingdom contract simply was not enough to keep all of the mines running for more than one to two years. It is gratifying that one major producer will stretch its deliveries under

1962 ANNUAL REPORT IN BRIEF

	1962	1961
Sales	\$26,695,497	\$29,606,817
Net Income	\$ 4,210,354	\$ 2,212,660
Taxes (Federal, Provincial, and Municipal)	\$ 4,191,035	\$ 3,705,050
Dividends	\$ 3,000,000	\$ 5,000,000
Expenditures for land, buildings and equipment \$	738,093	\$ 2,460,033
Mine ore treated — Beaverlodge (tons)	563,580	542,157
U_3O_8 produced — Beaverlodge (pounds) ...	1,959,788	2,214,894
Number of employees at end of year	848	885
Wages and salaries paid ...	\$ 5,663,706	\$ 6,092,405

both the existing contracts and the new United Kingdom order so that its operations can be carried on until the end of 1971. Eldorado, too, has planned its production with similar objectives, although its allocation of 3,083,000 pounds under the U.K. contract will not stretch as far as that of Rio Algom.

The Beaverlodge mine of Eldorado had a monthly output of 209,000 pounds of U_3O_8 in late 1959, when the United States made it known it would not take up its options for additional uranium after termination of existing contracts. The Beaverlodge schedule was reduced to 185,000 pounds per month, and a further cut-back to 150,000 pounds per month was made last year. Continuance of operation at this level will keep the mine in operation until early 1967.

The mine in itself is a rich national resource. It has indicated ore reserves for at least 12 years, calculated on the basis of today's production rate, and the geological picture is such that there is little doubt additional ore will be found. An active programme of development is underway to determine more fully the long term potential of the mine.

Eldorado is more than a mining company. It is probably the only fully-integrated uranium company in the Free World — producing ore, operating the nation's only uranium refinery, maintaining an efficient research and development organization, and conducting its own sales activities. It has been the core around which the entire uranium industry in Canada has been built.

A great deal of thought and planning has been devoted in the past year to the problem of preserving the Company's refinery at Port Hope, Ontario, as a vital unit of the Canadian industrial scene. Unfortunately, the refinery does not benefit to a major extent from the United Kingdom contract, which calls for delivery of uranium directly from the mines in the form of concentrates, rather than in a refined state. Unless additional business is found to keep the facilities and the employees engaged, the refinery operation will decline sharply in the near future.

Over the past 32 years many of the highly successful processes and techniques used in the treatment and refining of radium and uranium have been pioneered by Eldorado. The refinery represents, in modern equipment, in skilled personnel, and in the accumulation of many years of experience and know-how, a priceless and unique asset of national industry. Were it allowed to fall into total disuse for even a few years, with a concurrent lapse in the acquisition of new knowledge and skills, the Canadian uranium industry would be handicapped severely in meeting the competitive challenges of the new markets which are certain to develop.

While the refinery was designed and developed to a high level of efficiency to serve the specific needs of the uranium industry, its unique functions are adaptable to

a host of applications on behalf of industry at large. The same is true of our Research and Development Division.

Eldorado Mining and Refining Limited therefore is offering to place its unusual combination of specialized experience and facilities at the disposal of other industries, on a custom basis. If advantage is taken of this offer to the degree we hope for, not only will we be able to maintain the skills and facilities we possess, but the Company will be able to render an important service to the entire industrial community.

Over the years Eldorado has made important contributions to such successful processes as its method of solvent extraction, the use of moving bed reactors for hydrogen reduction and hydrofluorination reactions, and techniques for production of uranium metal ingots weighing up to two tons. It played a part in making Canada's first Cobalt-60 unit for the treatment of cancer. It has pioneered production processes for scores of uranium compounds and for various types of nuclear fuel units.

The refinery facilities, backed by a Research and Development Division with an outstanding staff of scientists and engineers and an excellent metallurgical research laboratory, are available to assist other companies to meet unusual scientific and production problems for which they may lack technical know-how and equipment. Mining companies, for example, may find it economical and efficient to adopt some form of solvent extraction, a process in which Eldorado has abundant experience. As another example, companies engaged in work with high temperature alloys might consider custom use of Eldorado's vacuum induction furnace, the largest in Canada and one of the most modern and flexible units of the kind in North America. There are many ways in which a co-operative effort between a customer firm and Eldorado might further and expand the industrial technology and capacity of Canada.

The Research and Development Division of Eldorado, while continuing its work on the improvement of uranium production processes and the quality of the product, has broadened its programmes of research into new and important fields.

The search for potential non-nuclear uses of uranium, initiated by Eldorado as early as 1959, was extended through 1962 in conjunction with the Canadian Research Foundation, the Mines Branch, and other research agencies. The addition of uranium to steel continues to be promising and good results came out of field tests in 1962. Of particular value was the discovery of means to make "brittle" uranium, a form of the metal which is cheaper to produce than the ferro-uranium alloys formerly used in steel-making. Uranium steel seems especially promising for high quality steel.

The Division is devoting increasing attention to non-uranium studies relating to a wide range of elements,

such as zirconium, molybdenum, tungsten, hafnium, tantalum, columbium, vanadium, scandium, tellurium and yttrium.

Many of these elements are becoming of increasing importance in this age of nuclear energy, space exploration, advanced electronics and complex organic chemistry. Zirconium, for example, has vital uses in connection with nuclear reactor fuels. Vanadium is important in the making of certain alloy steels.

While all of these elements are found in Canada, there is little or no production for industrial purposes and the nation must import its requirements. The Eldorado research programme, employing such techniques as solvent extraction, ion exchange, hydrometallurgy and high temperature metallurgy, focuses upon developments that might lead to production in Canada of materials not now produced in this country. Where possible, the raw materials would be such things as low-grade concentrates, middlings, residues, and scrap of more expensive metals.

This enlarged and constructive activity in research has been made possible by a decision of Eldorado's Board of Directors to increase the budget of the Research and Development Division by \$400,000 annually for the next three years. A number of scientists are being recruited to assist in the undertaking.

Eldorado continues to contribute about \$40,000 yearly toward the Canadian Uranium Research Foundation, which is supported as well by other major producers. The Foundation is doing effective research into non-nuclear uses for uranium. The Company also provides more than \$60,000 annually in aid of university research in areas related to the Company's interests, and is working in closer conjunction with the universities than ever before.

During 1962 Eldorado reorganized and strengthened its sales group with a view to broadening and intensifying the search for markets throughout the Free World. While uranium business is not apt to develop quickly in light of the current over-supply situation, the results to date have been encouraging.

The operations of the Company's two wholly-owned subsidiaries, Northern Transportation Company Limited and Eldorado Aviation Limited, have suffered some curtailment as a direct result of the stretch-out in uranium production. Both continue, however, to provide services of a high order and have maintained efficiency and good morale.

The Board of Directors welcomed two new members at its September meeting, Mr. Frederick R. Hadley of Prince Albert, Sask., and Mr. John Errol Sydie of Edmonton, Alta. The appointments filled vacancies on the Board caused by the retirements of Mr. R. T. Birks, President of Willroy Mines Limited, and Mr. Eldon L. Brown, President of Sherritt Gordon Mines Limited.

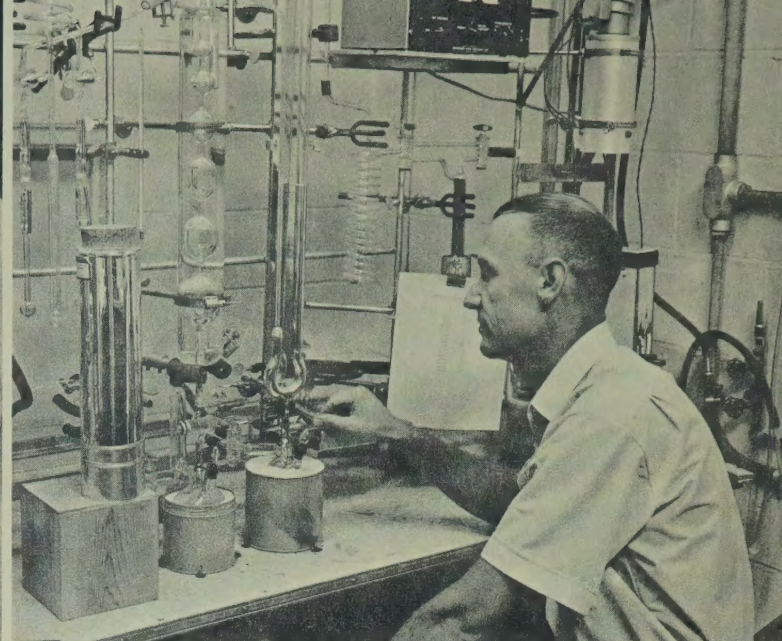
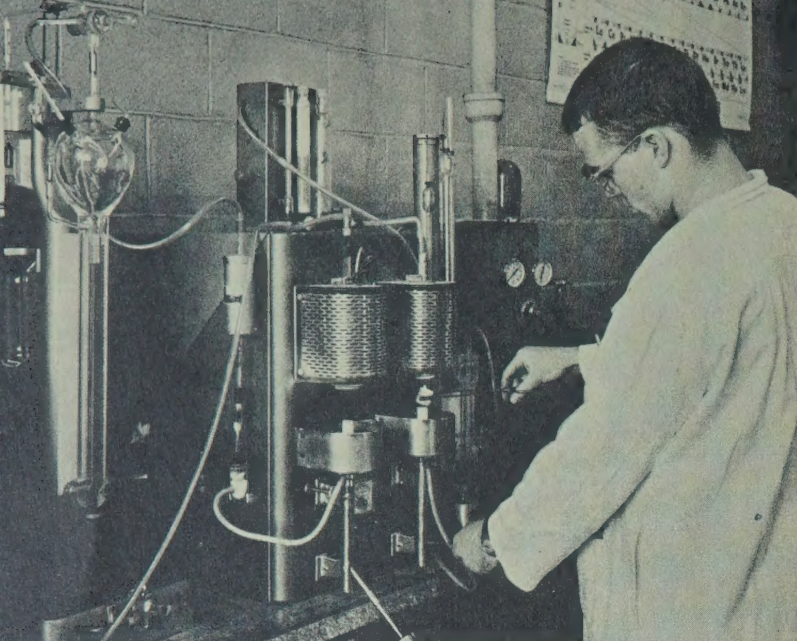
Your Board of Directors again records sincere appreciation of the loyal efforts of the employees of Eldorado Mining and Refining Limited and of its two subsidiaries, Northern Transportation Company Limited and Eldorado Aviation Limited. Notwithstanding the uncertainties of the past year, there has been no let-down in the efficiency of our personnel nor in their sincere interest in the welfare and progress of the Companies they serve.

For the Directors,

W. M. Gilchrist
President.

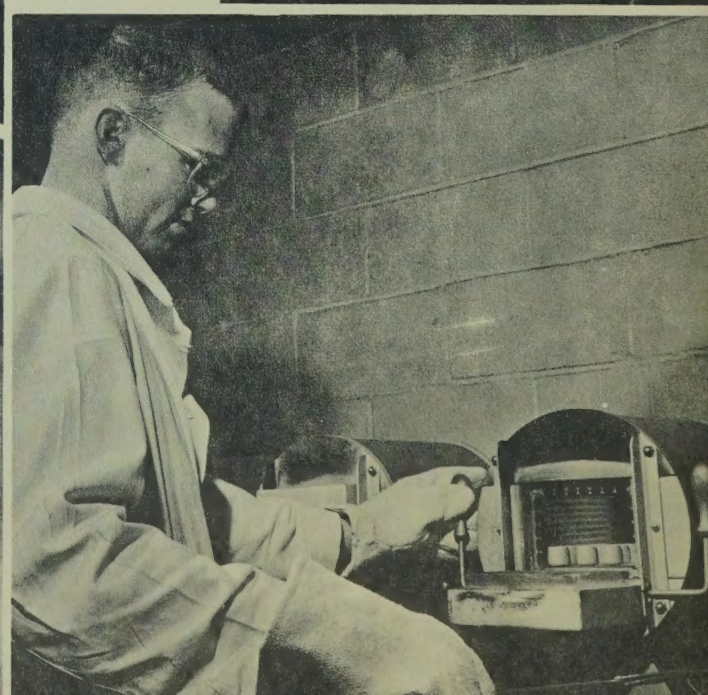
Ottawa, Canada,

March 20, 1963.

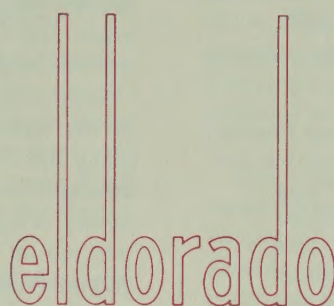


ELDORADO LABORATORY

Some of Canada's most highly qualified scientists, engineers and technicians carry on an extensive research and development programme in Eldorado's modern and well equipped metallurgical laboratories at Tunney's Pasture, Ottawa. Facilities include even a pilot scale grinding mill. Shown here are some of the devices employed in such fields as solvent extraction, ion exchange, hydrometallurgy and high temperature metallurgy. Scientific personnel and facilities of Eldorado are available to assist industry at large on a co-operative basis.



GENERAL REPORT FOR 1962



and wholly-owned subsidiaries

Northern Transportation Company Limited
Eldorado Aviation Limited

Comments upon the operations of Eldorado Mining and Refining Limited and its wholly-owned subsidiaries, Northern Transportation Company Limited and Eldorado Aviation Limited, for the year ended December 31, 1962, are included in the following General Report:

Income

In the year ended December 31, 1962, Eldorado Mining and Refining Limited earned a net profit of \$4,210,354, after provision of \$3,600,000 for income tax and \$302,386 for Saskatchewan royalty. The comparative figure for net earnings in 1961 was \$2,212,660, which was arrived at after providing \$2,125,000 for income tax, \$785,000 for reduction in valuation of inventories, and \$1,297,307 for Saskatchewan royalty, of which \$577,307 was applicable to operations of a prior year. Interest and other non-operating income, including earnings from the financing of ore procurement operations, increased during the year 1962 by \$919,643.

The Company's sales in 1962 were valued at \$26,695,497, a reduction of \$2,911,320 from the 1961 total of \$29,606,817. The reduction in sales volume was accompanied by a corresponding reduction in cost and reflected a further stretch-out of deliveries under contract arrangements with the United States Atomic Energy Commission and the United Kingdom Atomic Energy Authority.

Grants amounting to \$288,649 were paid by the Company in 1962 in lieu of taxes to the municipalities of Uranium City, Port Hope, Ottawa and Edmonton, as compared with \$282,743 in 1961.

Dividends

The dividend of \$3,000,000 paid by the Company to the Receiver General on November 1, 1962, was \$2,000,000 less than was paid in 1961, reflecting the Company's need to conserve cash resources to meet the substantial financing requirements which will arise in 1963 and later years under the new 12,000-ton contract with the United Kingdom. Since the Crown acquired ownership of Eldorado Mining and Refining Limited in 1944, the total remitted in dividends and redemption of shares is \$28,740,000, which is \$19,493,123 more than the Government's original investment of \$9,246,877.

Capital Expenditures

The Company's programme of capital expenditures at the beginning of 1962 was \$605,695, and an additional \$505,465 was authorized during the year to bring the total to \$1,111,160. The actual expenditure against this programme was \$738,093.

The largest single addition to capital account was related to the electronic ore sorting plant at Beaverlodge, which was completed and placed in operation early in 1962. Other major items included additional expenditures on the Waterloo Lake hydro-electric power project; installation of an electric steam boiler and underground trolley facilities at the mine; and installation at the Port Hope refinery of equipment for the production of ceramic oxide and uranium carbide.

A capital programme amounting to \$447,125 has been authorized for 1963. This is substantially less than the outlay in 1962 and is regarded as a minimum sum to meet 1963 requirements.

Mine Operations

Production from the Beaverlodge Operation in 1962 amounted to 1,959,788 pounds of U_3O_8 recovered from 563,580 tons of ore grading 0.194 per cent U_3O_8 .

Comparative production statistics, excluding custom ore treated, are:

	Tons of Ore Treated	Pounds U_3O_8 Recovered	Average Recovery Pounds per Ton
1962	563,580	1,959,788	3.48
1961	542,157	2,214,894	4.09
1960	625,127	2,454,400	3.93
1959	657,521	2,392,770	3.64
1958	676,354	2,507,663	3.71
1953-62 incl.	4,271,048	16,600,780	3.89

In addition to the production shown above, in the years prior to 1961 Eldorado also treated custom ore delivered to the Beaverlodge mill from other mines in the area. Another source of U_3O_8 for Eldorado was its Port Radium mine on Great Bear Lake, which ceased operations in late 1960.

The decrease in production in 1962 reflects a second cutback in monthly quotas to stretch out assured contracts. The initial reduction in schedules was made early in 1960. Costs per ton and per pound were well maintained in 1962 in spite of lowered output.

Development work carried out in 1962, along with cumulative figures for prior years to December 31 last, are shown in the following table:

(in feet)	1962	Cumulative Total
Shaft-sinking	393	7,126
Drifting cross-cutting	9,220	191,276
Raising	8,127	64,877
Underground diamond drilling	76,129	787,354
Sludge drilling	10,134	106,776

Proved, probable and pillar ore reserves at the end of 1962 totalled 1,581,800 tons grading 0.23 per cent U_3O_8 , comparing with 1,801,400 tons grading 0.23 per cent at the end of 1961. The opening up of additional ore has been below normal over the past two years, during which development work has consisted mainly in shaft-sinking and lateral drives towards known ore bodies. Development work towards new ore bodies has now been intensified with a view to determining more fully the potential of the property.

The sinking of a winze between Ace and Verna shafts, from the 9th to the 13th level, was completed in April, 1962. Lateral development from the winze was underway on the three new levels by the end of the year. Development work in West Fay proved up sufficient ore to warrant continuance of a concentrated programme in this area to determine the vertical extent of the known ore bodies.

Milling operations in 1962 were carried on with a further reduction in costs. The electronic ore-sorting

plant operated well, but sampling and assaying studies of reject material were being done at year's end to determine current accuracies. There were indications that a greater volume of waste material could be rejected. Test work also is being done towards a reduction of impurities in precipitate.

While some mechanical difficulties were experienced in the operation of the Waterloo Lake hydro-electric plant which was started early in the year, results amply demonstrated the cost advantages of hydro versus Diesel power. A 5,000 kilowatt electric boiler was installed and was put on the line in December, to take advantage of surplus hydro power.

Capital expenditures planned for 1963 will cover additions and replacements of mining equipment and some items to improve the mill process.

Refinery Operations

The solvent extraction circuit operated on a five-day-week, maximum through-put schedule throughout 1962 and total production of orange oxide for the United States Atomic Energy Commission contract was the highest since 1958, when the refinery was on a seven-day-week schedule. Unit operating costs were the lowest since the new solvent process was begun in 1955.

The hydrofluorination section of the green salt plant completed in late February a run that had begun in October, 1961. Resulting metal reduction operations through April and May produced sufficient uranium metal for market requirements and for inventory.

The first depleted uranium metal was produced during the year from green salt (uranium tetrafluoride). This material has been used to produce low cost non-nuclear uranium alloys and high density shielding.

As a result of widespread acceptance of the excellent characteristics of Eldorado's ceramic grade uranium oxide, market requirements increased substantially during the year. To meet delivery schedules it was necessary to install an additional furnace line and to place the entire ceramic oxide operation on a seven-day operating schedule in the latter part of the year. Foreign sales of this material exceeded those to domestic consumers.

The enriched uranium processing circuit mentioned in last year's report was completed in 1962. Design of the circuit was a complex procedure because of the criticality hazards involved and the limits on size, shape and location of the equipment. Invaluable assistance was given by the Criticality Panel of Atomic Energy of Canada Limited and the personnel of the Atomic Energy Control Board.

The circuit was used over the last five months of the year to process small orders of various enrichments for Atomic Energy of Canada Limited, starting with enriched oxide. By the end of the year the entire circuit had

been checked out and was ready to begin processing of enriched ceramic oxide starting from uranium hexafluoride. A series of enriched uranium metal—aluminum alloy billets were made for Atomic Energy of Canada for use in a small diameter rod extrusion programme.

The first uranium melts were made in Eldorado's new vacuum induction furnace in February. Billets in diameters up to five inches, from both pure uranium metal and uranium metal alloys, have been cast in single and multiple molds. Large slabs also have been made. Such castings formerly were available only from the United States.

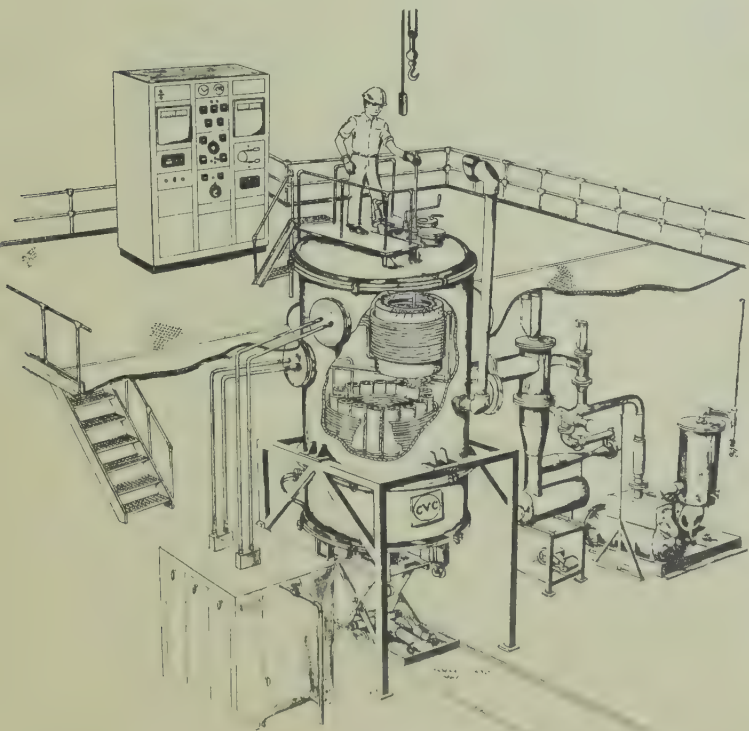
Two small experimental vacuum melting furnaces were installed, one of which was converted for use in a uranium carbide development programme. Studies are continuing on crucible materials for non-uranium products adaptable to high temperature vacuum melting.

Requirements for metal fabrication programmes were reduced in 1962, but the sales volume of other non-contract refined products showed a marked increase over 1961, with more foreign and domestic orders covering both natural and enriched uranium.

Research and Development

There was a major change in emphasis in the activities

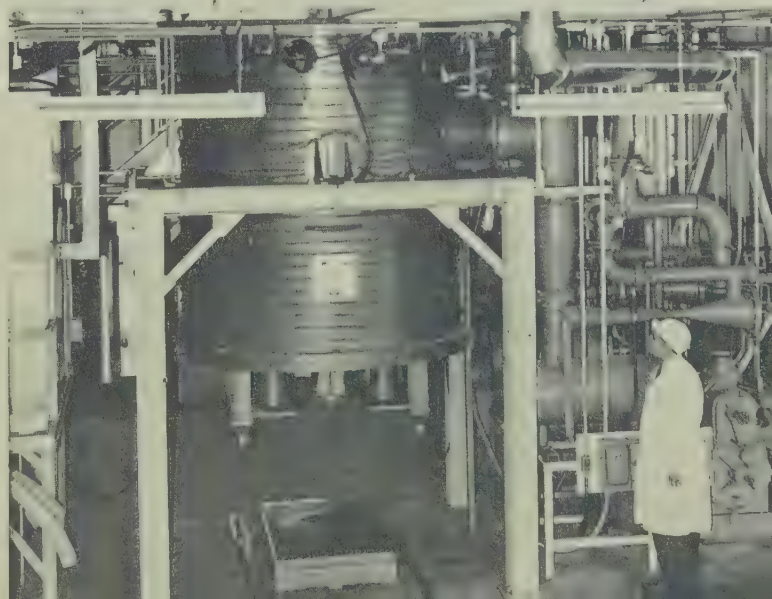
The largest vacuum melt induction furnace in Canada, and one of the most modern and flexible units of its kind in North America, was placed in operation at Eldorado's Port Hope Refinery in 1962. The photograph and schematic drawing give some idea of the size and complexity of the installation.



of the Research and Development Division in 1962, particularly after a decision of the Board of Directors on July 31 by which appropriations were made available for a three-year programme for new product development. The principal aim of this programme is the development of processes leading to diversification of Eldorado's operation at Port Hope by production of non-uranium metals and compounds.

The general specifications for the three-year research undertaking are: (a) That it shall be aimed towards production of metals and compounds not now produced in Canada, and that can readily be sold in Canada or on the world market; (b) That the processes should be based on techniques related to Eldorado's previous operations and using, if possible, its existing equipment; and (c) That priority be given to the production of rare and relatively valuable elements and compounds.

Research work on the Beaverlodge process continued at a steady rate throughout the year, but development work at the refinery having to do with natural uranium metal and ceramic oxide and the Port Hope solvent extraction operation was greatly reduced. Some contract research, development and analytical work was done for outside organizations, at their request, making use of





Eldorado's Research and Development Laboratories at Tunney's Pasture, Ottawa, Canada.

special skills and equipment available at the Ottawa laboratories.

Following is a summary of some of the year's activities:

Beaverlodge Processing

Significant reductions in cost were achieved through savings in reagents, grinding steel and power, notwithstanding the lower tonnage treated.

The pilot plant operation on recycling of precipitates was concluded, with results indicating further savings in reagent costs. Additional changes to this system will be made in 1963.

Work was done towards a reduction of steam requirements by such means as a reduction in agitation air, use of carbon dioxide from steam stripping to replace flue gas, and diffusion of air and oxygen to leaching. Laboratory and pilot plant work have indicated that under present conditions oxygen is an economic replacement for air, and a larger pilot plant is being built for further checking.

Penalties provided under the new United Kingdom contract spurred development work on the removal of certain impurities, such as ionium, from Beaverlodge concentrates. The project will reach the pilot plant stage by the summer of 1963. A further aim of the retreatment system is the recovery of such by-products as vanadium and scandium.

Refining Process and Products

Most of the development work at Port Hope had to do with uranium carbide, and with enriched alloys and products for special applications. Equipment for the production of enriched uranium oxide was installed in the plant, and laboratory work was done on some phases of the process, such as conversion of UF_6 to UO_2F_2 , precipitation of ammonium diuranate, and the corrosion resistance of materials.

Non-nuclear Uses of Uranium

Much work in this area was concentrated on master alloys for uranium steel production, including ferro-uranium alloys, uranium silicon, and uranium aluminum. A method for the production of "brittle" uranium was found. This is a cheaper source of granular uranium for uranium steel than is ferro-uranium, and constitutes another worthwhile step along the way in the making of

steel with uranium additives for a variety of purposes. Eldorado continues to play an active role in this potentially important field of use for uranium.

New Product Development

Recruitment of staff, both professional and non-professional, was necessary to meet the demands of the expanded programme and to fill vacancies created by the loss early in the year of a number of staff members.

Fields for study were narrowed and priority elements on the list at years end were zirconium-hafnium metal and oxide; molybdenum metal, tungsten metal, tantalum and columbium metal and oxides, vanadium compounds and metal. An increasing amount of analytical work was done in order to have accurate and fast methods of analysis for the elements of interest to the project.

Samples were obtained of such raw materials as slags, residues, concentrates, crude oxides and leach solutions, and negotiations were begun for additional samples. The Division is especially interested in such materials as can be treated to advantage by solvent extraction. Beaverlodge products and refinery residues are being analyzed in search for elements that may be recovered as by-products, such as vanadium, scandium, yttrium and rare earths.

Ore Procurement

The major activity in this area during 1962 had to do with the completion of negotiations for the United Kingdom contract for 24,000,000 pounds of uranium, and the subsequent agreements with the Canadian producing companies.

The allocation was as follows: Bicroft Division of Macassa Gold Mines Ltd., 949,875 pounds; Gunnar Mining Ltd., 2,916,284; Faraday Uranium Mines Ltd., 1,083,191; Denison Mines Ltd., 5,665, 923; Rio Algom Mines Ltd., 7,415,693; Stanrock Uranium Mines Ltd., 2,886,105; Eldorado Mining and Refining Ltd., 3,082,929.

Scheduled deliveries of Canadian uranium under Eldorado contracts with the United States Atomic Energy Commission and the United Kingdom Atomic Energy Authority, covering the output of all producers, are as follows:

	To the U.S.A.E.C. (Short tons U_3O_8)	To the U.K.A.E.A. (Short tons U_3O_8)
1963	4,521	3,069
1964	1,801	4,292
1965	611	2,288
1966	459	1,641
1967	—	1,226
1968	—	1,200
1969	—	1,200
1970	—	1,200
1971	—	933
Totals	7,392	17,049

(Continued on page 20)

ELDORADO MINING AND REFINING LIMITED

Statement of Income and Expense

FOR THE YEAR ENDED DECEMBER 31, 1962

(with comparative figures for the year ended December 31, 1961)

	1962	1961
INCOME:		
Sales	\$ 26,695,497	\$ 29,606,817
EXPENSE:		
Mining, milling and refining	11,677,072	14,876,879
Purchased concentrates	93,525	497,408
Depreciation	3,951,825	3,900,469
Amortization of cost of acquiring rights to deliver concentrates on cancellation of contract with another producer	3,233,650	4,177,557
Amortization of pre-production, mine development and other deferred expenditures	836,126	1,101,717
Reduction in valuation of inventories	—	785,000
Grants in lieu of municipal taxes	288,649	282,743
Exploration	—	105,594
Scientific research	351,313	200,335
Sales expense	100,662	69,491
	20,532,822	25,997,193
NET INCOME FROM OPERATIONS	6,162,675	3,609,624
Income arising from the financing of ore procurement programme	263,956	—
Interest and other non-operating income	1,383,723	728,036
	7,810,354	4,337,660
Provision for income tax	3,600,000	2,125,000
NET INCOME:	\$ 4,210,354	\$ 2,212,660

The accompanying notes are an integral part of the financial statements. (See page 14.)

Eldorado Mining and Smelting Co., Ltd.

(Incorporated under the laws of Canada)

BALANCE SHEET

at December 31, 1962

(with comparative figures for 1961)

ASSETS	1962	1961
CURRENT ASSETS:		
Cash	\$ 628,208	\$ 355,001
Deposit with Receiver General	13,200,000	13,200,000
Treasury bills and short-term bank deposits	19,274,202	10,926,386
Accounts receivable	3,053,711	9,587,427
Advances in respect of concentrates to be received	16,838,721	4,751,912
Concentrates and refinery products valued at lower of cost or realizable value	15,742,929	17,429,157
Operating and general supplies, at cost	3,039,701	4,091,386
Prepaid expenses	130,121	195,999
	<u>71,907,593</u>	<u>60,537,268</u>
Advances in respect of concentrates to be received in later years	24,180,913	23,528,681
Deferred account receivable in respect of concentrates delivered (Note 1)	3,988,178	—
	<u>28,169,091</u>	<u>23,528,681</u>
INVESTMENTS AND LOANS:		
Investments in wholly-owned subsidiary companies, at cost	187,153	187,153
Employees' housing loans	371,243	482,427
Municipal Corporation of Uranium City and District 5% debentures, maturing 1975 to 1979	914,514	964,219
	<u>1,472,910</u>	<u>1,633,799</u>
DEFERRED CHARGES:		
Unamortized pre-production, mine development and other expenditures	1,277,964	2,069,119
Unamortized cost of acquiring rights to deliver concentrates on cancellation of contract with another producer	6,589,496	9,823,146
	<u>7,867,460</u>	<u>11,892,265</u>
Excess of costs and expenses over sales of concentrates procured from other producers, recoverable before completion of contracts (Note 2)	1,788,367	—
CAPITAL ASSETS:		
Property, plant and equipment, at cost	49,955,307	49,961,814
Less: Accumulated depreciation	43,180,098	40,008,387
	<u>6,775,209</u>	<u>9,953,427</u>
	<u>\$ 117,980,630</u>	<u>\$ 107,545,440</u>

The accompanying notes are an integral part of the financial statements. (See page 14)

Approved on behalf of the Board

W. M. GILCHRIST,
Director.

W. F. JAMES,
Director.

Refining Limited

(Companies Act)

BALANCE SHEET

1962

(December 31, 1961)

	LIABILITIES	1962	1961
CURRENT LIABILITIES:			
Accounts payable	\$	6,012,189	\$ 11,522,095
Provision for income tax		2,654,977	1,476,462
Advance payments in respect of concentrates and other products to be delivered		28,167,710	13,927,272
		<u>36,834,876</u>	<u>26,925,829</u>
Advance payments in respect of concentrates to be delivered in later years		<u>30,877,688</u>	<u>31,561,899</u>
CAPITAL:			
Capital Stock:			
Authorized — 110,000 shares of no par value			
Issued — 70,500 shares, fully paid		6,586,080	6,586,080
Surplus		43,681,986	42,471,632
		<u>50,268,066</u>	<u>49,057,712</u>
		<u>\$ 117,980,630</u>	<u>\$ 107,545,440</u>

I have examined the above Balance Sheet and the related statement of Income and Expense and have reported thereon under date of March 20, 1963 to the Minister of Trade and Commerce.

A. M. HENDERSON,
Auditor General of Canada.

ELDORADO MINING AND REFINING LIMITED

Notes to Financial Statements

1. Deferred Account Receivable

The contract negotiated by Eldorado Mining and Refining Limited with the United Kingdom Atomic Energy Authority for the sale of 12,000 tons of uranium in concentrates provides for certain deliveries on which payments do not become due until later years of the contract period. The account receivable thus deferred at December 31, 1962 and amounting to \$3,988,178 will increase in subsequent years, reaching a peak of almost \$32,000,000 in March 1965 and declining thereafter until it is fully paid at the end of the contract in 1973.

2. Excess of Costs and Expenses over Sales of Concentrates procured from other Producers

Uranium concentrates are purchased by the Company, as uranium procurement agent for the Crown, at various prices determined by separate agreements with each producer. In some cases the purchase prices are higher, and in other cases lower, than the prices at which concentrates are sold to the United States Atomic Energy Commission and the United Kingdom Atomic Energy Authority. Although all purchase costs will be fully recovered before the contracts are completed, there are periods within the life of the contracts when total cost of concentrates sold exceeds total revenue from sales. During these periods, temporary financing is provided, as required, by Eldorado Mining and Refining Limited. Charges are being applied against the contract revenue for the Company's services in administering and financing the ore procurement programme.

During 1962 the cost of purchased concentrates delivered to the Commission and the Authority exceeded the revenue from sales by \$1,480,156. Administrative expenses and financial charges for the period amounted to \$308,211. The resultant excess of costs and expenses over sales of \$1,788,367 will be offset in subsequent periods when deliveries will be made at prices exceeding the costs of acquisition.

3. Statements of Claim

Statements of claim aggregating approximately \$20,000,000 have been received by the Company in respect of alleged breaches of contract. Officers and legal counsel of the Company deny any liability whatsoever under these claims.

4. Supplementary Information

Included in expenses for 1962 are: directors' fees, \$4,833; legal fees, \$469; and remuneration of executive officers, \$137,600.

ELDORADO MINING AND REFINING LIMITED

Statement of Sales and Costs of Uranium Concentrates Procured from other Producers

for the year ended December 31, 1962

(with comparative figures for the year ended December 31, 1961)

	1962	1961
Sales under contract with:		
United States Atomic Energy Commission	\$ 133,780,751	\$ 160,130,767
United Kingdom Atomic Energy Authority	18,183,255	17,413,931
	<hr/> 151,964,006	<hr/> 177,544,698
Cost of concentrates sold	153,444,162	177,544,698
	<hr/> 1,480,156	<hr/> —
Excess of Cost over Sales		
Administrative expenses	44,255	—
Financial charges	263,956	—
	<hr/> 308,211	<hr/> —
Excess of costs and expenses over sales of concentrates procured from other pro- ducers, recoverable before completion of contracts (Note 2)	\$ 1,788,367	—

The accompanying notes are an integral part of the financial statements.

ELDORADO MINING AND REFINING LIMITED

Statement of Surplus

for the year ended December 31, 1962

(with comparative figures for the year ended December 31, 1961)

	1962	1961
Balance at beginning of year	\$ 42,471,632	\$ 45,258,972
Net profit for year	4,210,354	2,212,660
	<hr/> 46,681,986	<hr/> 47,471,632
Dividend	3,000,000	5,000,000
	<hr/> 43,681,986	<hr/> 42,471,632
Balance at end of year	\$ 43,681,986	\$ 42,471,632

AUDITOR GENERAL OF CANADA

Ottawa, March 20, 1963.

The Honourable M. W. McCutcheon,
Minister of Trade and Commerce,
Ottawa.

SIR,

I have examined the accounts and financial statements of Eldorado Mining and Refining Limited for the year ended December 31, 1962. In compliance with the requirements of section 87 of the Financial Administration Act I report that, in my opinion:

- (a) proper books of account have been kept by the Company
- (b) the financial statements of the Company
 - (i) were prepared on a basis consistent with that of the preceding year and are in agreement with the books of account,
 - (ii) in the case of the balance sheet, give a true and fair view of the state of the Company's affairs as at the end of the financial year, and
 - (iii) in the case of the statement of income and expense, give a true and fair view of the income and expense of the Company for the financial year; and
- (c) the transactions of the Company that have come under my notice have been within the powers of the Company under the Financial Administration Act and any other Act applicable to the Company.

In accordance with the requirements of section 118 of the Companies Act, R.S. 1952, I report that the profit for the year of Northern Transportation Company Limited, a wholly-owned subsidiary, has not been included in the accounts of Eldorado Mining and Refining Limited. The net expenses of Eldorado Aviation Limited, another wholly-owned subsidiary, were recovered from Eldorado Mining and Refining Limited and Northern Transportation Company Limited as at December 31, 1962.

Yours faithfully,

A. M. HENDERSON,
Auditor General of Canada.

NORTHERN TRANSPORTATION COMPANY LIMITED

(Incorporated under The Companies Act)

Balance Sheet

at December 31, 1962

(with comparative figures at December 31, 1961)

ASSETS		1962	1961	LIABILITIES		1962	1961
CURRENT ASSETS:				CURRENT LIABILITIES:			
Cash	\$	247,095	\$ 190,235	Accounts payable	\$	150,450	\$ 799,146
Treasury bills and short-term bank deposits		2,920,506	3,100,000	Provision for income tax ..		150,277	237,411
Accounts receivable		223,104	974,414			300,727	1,036,557
Operating and general supplies, at cost		339,998	423,387	Reserve for Insurance		1,250,000	500,000
		<u>3,730,703</u>	<u>4,688,036</u>				
Short-term Deposits held for Insurance Investment Fund		1,250,000	500,000				
CAPITAL ASSETS, at cost:							
Land		82,971	82,971				
Buildings, including equipment		2,290,236	2,252,183				
Boats and barges, including equipment		8,961,094	8,858,985				
Automotive equipment		1,032,516	1,079,601				
Other		103,144	104,801				
		<u>12,469,961</u>	<u>12,378,541</u>				
Less: Accumulated depreciation		10,990,621	10,502,946				
		<u>1,479,340</u>	<u>1,875,595</u>				
		<u>\$ 6,460,043</u>	<u>\$ 7,063,631</u>				
						<u>\$ 6,460,043</u>	<u>\$ 7,063,631</u>

Approved on behalf of the Board

W. M. GILCHRIST,
Director

W. B. HUNTER,
Director

I have examined the above Balance Sheet and the related Statement of Income and Expense and have reported thereon under date of March 14, 1963 to the Minister of Trade and Commerce.

A. M. HENDERSON,
Auditor General of Canada.

NORTHERN TRANSPORTATION COMPANY LTD.

Statement of Income and Expense

for the year ended December 31, 1962

(with comparative figures for the year ended December 31, 1961)

INCOME	1962	1961
Freight earnings	\$ 2,233,491	\$ 2,583,363
EXPENSE		
Operations and maintenance:		
Salaries and wages	647,335	692,783
Depreciation	477,371	517,201
Repairs and maintenance	242,573	289,164
Fuels and lubricants	125,518	127,036
Messing expense	105,983	109,375
Truck and tractor maintenance	20,939	21,769
Insurance	24,205	36,698
Switching, demurrage and spur expense .	21,765	13,230
Transportation of employees	22,644	15,363
Grants in lieu of municipal taxes	22,584	22,888
Pallet expense	10,527	12,529
Miscellaneous	21,200	20,208
	<u>1,742,644</u>	<u>1,878,244</u>
Administrative:		
Executive officers' salaries	32,701	30,493
Other salaries	73,778	68,933
Contributions to employees' pension plan	50,583	49,856
Parent company	15,000	15,000
Depreciation	10,797	10,227
Miscellaneous (including legal fees, \$116)	67,914	57,290
	<u>250,773</u>	<u>231,799</u>
Total Expense	<u>1,993,417</u>	<u>2,110,043</u>
NET INCOME FROM OPERATIONS	240,074	473,320
Interest from investments	136,205	87,543
Profit on disposal of fixed assets	6,240	5,000
	<u>382,519</u>	<u>565,863</u>
Provision for income tax	250,277	312,411
NET INCOME	<u>\$ 132,242</u>	<u>\$ 253,452</u>

NORTHERN TRANSPORTATION COMPANY LTD.

Statement of Surplus

for the year ended December 31, 1962

(with comparative figures for the year ended December 31, 1961)

	1962	1961
Balance at beginning of year	\$ 5,375,074	\$ 5,121,622
Transfer to Reserve for Insurance	750,000	
	<u>4,625,074</u>	
Net income for year	132,242	253,452
Balance at end of year	<u>\$ 4,757,316</u>	<u>\$ 5,375,074</u>

AUDITOR GENERAL

OF CANADA

Ottawa, March 14, 1963.

The Honourable M. W. McCutcheon,
Minister of Trade and Commerce,
Ottawa.

SIR,

I have examined the accounts and financial statements of Northern Transportation Company Limited for the year ended December 31, 1962. In compliance with the requirements of section 87 of the Financial Administration Act I report that, in my opinion:

- (a) proper books of account have been kept by the Company;
- (b) the financial statements of the Company
 - (i) were prepared on a basis consistent with that of the preceding year and are in agreement with the books of account,
 - (ii) in the case of the balance sheet, give a true and fair view of the state of the Company's affairs as at the end of the financial year, and
 - (iii) in the case of the statement of income and expense, give a true and fair view of the income and expense of the Company for the financial year; and

- (c) the transactions of the Company that have come under my notice have been within the powers of the Company under the Financial Administration Act and any other Act applicable to the Company.

Yours faithfully,

A. M. HENDERSON,
Auditor General of Canada.

ELDORADO AVIATION LIMITED

(Incorporated under the Companies Act)

Balance Sheet

at December 31, 1962

(with comparative figures at December 31, 1961)

ASSETS

CURRENT ASSETS:		
Cash	\$ 23,991	\$ 28,083
Accounts receivable:		
Eldorado Mining and Refining Limited ...	—	1,213
Northern Transportation Company Limited ...	26,790	3,344
Other	1,913	1,788
	<u>28,703</u>	<u>6,345</u>
Operating supplies, at cost .	53,306	56,382
Prepaid insurance	24,812	35,303
	<u>130,812</u>	<u>126,113</u>
Unamortized portion of Liability to Employees' Pension Plan in respect of past service benefits (contra)	—	40,000
CAPITAL ASSETS, at cost:		
Aircraft, including major spare parts	873,750	837,365
Building	32,426	32,426
Shop, hangar and loading equipment, etc.	34,138	33,548
Office furniture and equipment	7,873	7,873
	<u>948,187</u>	<u>911,212</u>
Less: Accumulated depreciation	793,116	742,102
	<u>155,071</u>	<u>169,110</u>
	<u>\$ 285,883</u>	<u>\$ 335,223</u>

LIABILITIES

CURRENT LIABILITIES:		
Accounts payable:		
Trade	\$ 29,062	\$ 39,534
Eldorado Mining and Refining Limited	1,132	—
	<u>30,194</u>	<u>—</u>
Liability to Employees' Pension Plan in respect of past service benefits (contra)	—	40,000
CAPITAL:		
Capital Stock:		
Authorized—50,000 shares of \$1 each		
Issued—28,006 shares, fully paid	28,006	28,006
Surplus	227,683	227,683
	<u>\$ 285,883</u>	<u>\$ 335,223</u>

Approved on behalf of the Board

W. M. GILCHRIST,
Director

A. B. CAYWOOD,
Director

I have examined the above Balance Sheet and the related Statement of Recoverable Expenses and have reported thereon under date of March 14, 1963 to the Minister of Trade and Commerce.

A. M. HENDERSON,
Auditor General of Canada.

ELDORADO AVIATION LIMITED

Statement of Recoverable Expenses

for the year ended December 31, 1962
(with comparative figures for the year ended December 31, 1961)

	1962	1961
Salaries, wages and contributions to employees' pension plan	\$ 250,658	\$ 262,972
Supplies	134,370	180,364
Depreciation	59,060	91,621
Repairs	81,500	88,136
Insurance	49,900	63,386
Hangar expense	32,175	33,509
Landing fees and radio maintenance	13,583	16,402
Travel	5,407	4,473
Miscellaneous	12,528	8,858
Total Expenses	639,181	749,721
Less: Miscellaneous income	29,842	10,304
Net Expenses	609,339	739,417

Note: The above net expenses were recovered from:

Eldorado Mining and Refining Limited	494,449	636,983
Northern Transportation Company Limited	114,890	102,434
	<u>\$ 609,339</u>	<u>\$ 739,417</u>

AUDITOR GENERAL

OF CANADA

Ottawa, March 14, 1963.

The Honourable M. W. McCutcheon,
Minister of Trade and Commerce,
Ottawa.

SIR,

I have examined the accounts and financial statements of Eldorado Aviation Limited for the year ended December 31, 1962. In compliance with the requirements of section 87 of the Financial Administration Act I report that, in my opinion:

- (a) proper books of account have been kept by the Company;
- (b) the financial statements of the Company
 - (i) were prepared on a basis consistent with that of the preceding year and are in agreement with the books of account,
 - (ii) in the case of the balance sheet, give a true and fair view of the state of the Company's affairs as at the end of the financial year, and
 - (iii) in the case of the statement of recoverable expenses, give a true and fair view of the expenses of the Company for the financial year;
- (c) the transactions of the Company that have come under my notice have been within the powers of the Company under the Financial Administration Act and any other Act applicable to the Company.

Yours faithfully,

A. M. HENDERSON,
Auditor General of Canada.

GENERAL REPORT

(Continued from page 10)

During 1962 concentrate sales under Eldorado contracts totalled 17,080,037 pounds of U_3O_8 valued at \$173,682,395, of which 14,955,250 pounds worth \$154,749,178 went to the United States and 2,124,787 pounds valued at \$18,933,217 went to the United Kingdom.

Organization and Personnel

The work force and payroll of the Company decreased in 1962, in line with the lowering of production under the stretch-out programme. The total number of employees at the end of 1962 was 848, comparing with 885 a year previously, and total wages and salaries amounting to \$5,663,706 compared with the 1961 figure of \$6,092,405.

The following table shows the number and distribution of employees at the year-end:

	Hourly- rated	Salaried	Totals at Dec. 31	
	Employees	Employees	1962	1961
Beaverlodge Operation	410	147	557	584
Port Hope Refinery	143	62	205	211
Research & Development	1	53	54	54
Edmonton Office	—	7	7	8
Head Office	—	25	25	28
Totals	554	294	848	885

During the year a majority of Head Office personnel was transferred to Port Hope, where suitable accommodation was available in the refinery office building. There was some concurrent realignment of functions and transfer of staff.

During 1962 the Company contributed \$252,700 to the Pension Plan and supported the Employees' Group Insurance and Welfare Plan to the extent of \$82,300.

A new three-year collective agreement covering the hourly-rated employees at Beaverlodge was negotiated in 1962.

Northern Transportation Co. Ltd.

A decline of 13.5 per cent in freight revenue, from \$2,583,363 in 1961 to \$2,233,491 in 1962, was reflected in a drop in profit before income taxes from the 1961 figure of \$565,863 to \$382,519 in 1962.

Total tonnage handled last year was 113,598 tons, as against 128,234 tons in 1961. A major reason was the decreased need for supplies by the two operating mines in the Beaverlodge area, Eldorado and Gunnar, and there also was a slight decrease in freight to serve the DEW Line. A further drop in tonnage is expected in the 1963 season in light of the planned reduction in requirements for the Beaverlodge area, especially with regard to bulk sulphur.

Capital expenditures of \$154,701 in 1962 covered the replacement of some mobile equipment, construction of a temporary warehouse and work area at Hay River,

and the purchase of new engines to improve the power and efficiency of the "Radium Charles". The programme for 1963 capital expenditures includes further construction at Hay River, improvements to Mackenzie River barges, and other items, for an aggregate of \$101,000.

Water conditions on the Athabasca and Mackenzie Rivers were unusually favourable in 1962 and, apart from some damage to marine equipment by high winds at Norman Wells, the season was completed without incident.

Again in 1962 the re-supply of the Distant Early Warning Line in the Canadian Arctic was completed successfully, with breakup and ice conditions extremely favourable. One vessel was returned to the United States Navy and the voyage from Tuktoyaktuk to Seattle, Wash., was made in a record time of ten days, with little difficulty because of ice.

There were 410 employees on payroll at the peak of the operating season, of which 152 were engaged in the Arctic operation serving the DEW Line. Wages and salaries amounted to \$916,085 in 1962. Contributions to the Pension Plan amounted to \$50,583 and to the Welfare Plan, \$15,060. Northern Transportation continued its long-standing policy of giving preference to the greatest possible degree in employing persons resident in the area served by the Company.

Eldorado Aviation Limited

The diminished operations at Beaverlodge because of the stretch-out resulted in a marked decrease in mileage flown and in freight and passengers carried by the aircraft of Eldorado Aviation Limited in 1962. The DC-4 operated throughout the year, and the DC-3 was in use from the beginning of April to the end of September. The Sikorsky S-55 helicopter was used to service the Waterloo Lake power plant until early Spring, and again during the Fall and early Winter. From mid-May until September it was dry-leased to Kenting Helicopters.

Freight and passengers carried by Company aircraft in 1962 totalled 4,966 tons, representing 2,598,523 ton-miles — 961 tons and 546,727 ton-miles less than in 1961. Cost of operation of the two transport aircraft amounted to \$581,171, a ton-miles cost of 22.28 cents, comparing with \$666,529 and a ton-miles cost of 21.19 cents in 1961. The dollar cost was down by \$85,358, or 12.8 per cent, while the ton-mile cost rose 1.09 cents or 5.1 per cent. The Company's 16-year average per ton-mile cost was 20.48 cents.

The DC-4 flew 282,610 miles and logged 1,325 flying hours in 1962, as against 350,670 miles and 1,595 hours in 1961. The DC-3 flew 109,265 miles and 641 flying hours, comparing with 108,855 miles and 622 hours in 1961. The drop in mileage for the DC-4 was attributable to the 25 per cent reduction in freight for Beaverlodge, while the slight rise in ton-miles and hours for the DC-3 was because of its use in bringing out personnel from

Eldorado Products and Services

Eldorado Mining and Refining Limited offers to industry at large not only an extensive range of uranium products, but a variety of specialized services and facilities adaptable to industrial research and production needs outside the field of uranium.

The Company has been refining uranium at Port Hope, Ontario, since 1933. For many years it has maintained a highly efficient Research and Development Division. The Company's facilities are up-to-date, its staff is highly trained, and it has the benefit of thirty years of experience and technical know-how.

The easing of demand for uranium makes it possible for Eldorado to make available, on a custom basis, some of its unique facilities and knowledge. Enquiries are invited from firms which may be engaged in undertakings which require scientific skills or specialized laboratory or production facilities not readily available elsewhere. Eldorado can be particularly helpful in the techniques of solvent extraction, ion exchange, hydro-metallurgy and high temperature metallurgy.

Eldorado laboratories are well equipped for metallurgical research and, where necessary and desirable, experimentation can be extended to use production facilities and techniques in the mill or refinery. For example, the refinery has the largest vacuum induction furnace in Canada, one of the largest and most flexible units of the kind in North America. It is adaptable to use in the field of high temperature alloys and, like many other facilities of Eldorado, can be made available for use on a custom arrangement.

The Company's primary interest continues, of course, to lie in the production of uranium metal and uranium compounds of consistent quality and the highest purity. A listing of its principal uranium products will be found on the facing page. It is recognized that because of rapid

developments in the nuclear energy field, the type of uranium compounds and fuel requirements for the future may differ greatly from present day needs. Eldorado's research facilities and technical and practical knowledge can be combined to assist customers in obtaining the most suitable and economical material to meet their particular specifications. The Company offers such services as custom refining, processing and fabrication; custom analysis; expert advisory help by experienced engineers, chemists and metallurgists; facilities and personnel for laboratory and pilot plant work.

During the past year Eldorado expanded its facilities to make possible the processing of enriched uranium from UF_6 to ceramic grade UO_2 for the domestic and export markets. High density pellets of excellent characteristics are now available in enriched, as well as in natural uranium.

New methods and additional equipment also enable Eldorado to make castings from uranium metal or alloys in intricate shapes and to exacting dimensions. Castings can be produced to customer specifications in natural uranium metal, depleted uranium metal, a wide range of uranium metal alloys, and other metals. Eldorado also can supply uranium metal in the form of machined ingots, forged and rolled shapes, and completely fabricated fuel elements.

Canadian export regulations at present permit individual sales of up to 250 pounds of uranium to agencies in countries with which Canada does not have an Agreement for Co-operation in the Peaceful Uses of Atomic Energy. The total of such sales to any one country is limited to 2,500 pounds until such an agreement has been concluded. Larger quantities of uranium in its various forms are available to those countries with which Canada has concluded an agreement.

Tuktoyaktuk at the end of the navigation season.

Total costs were down because of reduced operations, a decrease of \$32,500 in depreciation, and a decline of \$30,000 in salaries and wages. Staff had been reduced from 32 at the end of 1961 to 27 at the end of 1962. The 1962 total wages and salaries was \$229,387. Company contributions to the Pension Plan amounted to \$18,058

and to the Welfare Plan, \$3,597.

Late in December Eldorado Aviation Limited purchased a Bell G2 Helicopter to support the Northern Transportation Company operation on the DEW Line and to service Eldorado's hydro plants. A second one is to be bought for the same purposes early in 1963. The Sikorsky S-55 will be sold.



The famous Port Radium Mine of Eldorado on the eastern shore of Great Bear Lake, almost within the Arctic Circle, was not only the first, but one of the richest of Canada's uranium mines.

The History of Eldorado and its Subsidiary Companies

In 1900 the report of a Government geologist mentioned the finding of "rock stained with cobalt bloom and copper green" on the eastern shores of Great Bear Lake. It added, almost as an after-thought, that there might be deposits of pitchblende, the mother ore of radium and uranium.

Pitchblende was found by prospectors in 1930 and the original Eldorado Gold Mines Limited staked claims and began development of the property that was to become famous as the Port Radium mine, 27 miles under the Arctic Circle and over 1,000 miles north of Edmonton.

The refinery at Port Hope made its first shipment of Canadian-produced radium in 1933. In November, 1936, it completed production of its first ounce (28 grams) of radium, and by 1938 a monthly output of 2½ grams was reported. The actual product of the refinery, from concentrates shipped by air, water and rail from Great Bear Lake, was radium bromide of 90 per cent purity. This was shipped to England for accurate determination

of radio-active content, final refinement, and preparation into useable form.

Most of the world's supply had come from the Belgian-owned mines in the Congo. Even though the amounts involved seem relatively minute, the rising Canadian production broke the Belgian monopoly and the price of radium dropped rapidly. In 1940 demand had diminished, substantial inventories were on hand, and Eldorado closed the Port Radium mine.

Concurrent with the production of radium through the 1930's, Eldorado had sold substantial quantities of silver from the mine and had developed a small market for such uranium salts as yellow and orange sodium uranate and black oxide, mainly for use in the colouring of glass and ceramics. The price of these salts ranged from \$2.50 to \$2.92 per pound in 1938.

An urgent need for uranium in quantity arose with the inception in 1942 of the Manhattan Project, the joint British - United States - Canadian undertaking which

eventually brought forth the atomic bomb. Canada's chief role was to supply the uranium raw material, and the Government requested the re-opening of the Port Radium mine on an emergent basis, but with no hint as to the reason. The mine and mill, as well as the Port Hope refinery, were in full operation by early 1943. Shipments of uranium were made, but it is believed the actual material used for the first atomic bomb was not of Canadian origin.

In June, 1943, the Company name was changed from Eldorado Gold Mines Limited to Eldorado Mining and Refining Limited. Late in that year, when it became evident the atomic bomb would be feasible, the three governments concerned decided that they should at once gain complete control of uranium resources within their respective territories. On January 28, 1944, Eldorado was expropriated and the operation was taken over by the Crown-owned Eldorado Mining and Refining (1944) Limited. Northern Transportation Company Limited was taken over at the same time.

The Port Radium mine was exceedingly rich, but eventually its ore gave out and it ceased operations and was placed on a caretaker basis in September, 1960. Meanwhile, Eldorado prospectors had found important ore deposits in the Lake Athabaska region, leading to development of the Beaverlodge mine which went into production in 1953.

Eldorado was the sole producer of uranium in Canada until cold war demands created new and urgent demands which led to the discovery and development of further deposits of ore, especially in the Blind River (Elliot Lake) and Bancroft areas of Ontario and the Beaverlodge region of Northwestern Saskatchewan. By 1958 there were 18 producing mines in Canada, and the peak production of almost 31,000,000 pounds of U_3O_8 was attained the following year.

The amount of uranium provided by Eldorado for military purposes during World War II and up to incorporation of the Crown corporation in 1944 is still classified information. However, the Company's revenue from 1944 to the end of 1954, from the sale of uranium and from some sales and rentals of radium, was about \$82,000,000. Its income from uranium sales in the period 1955-62 inclusive was \$212,986,000 and, in the same term, its revenue from operation of the refinery amounted to \$30,177,000. The Company's aggregate income from 1944 to the end of 1962 was just over \$325,000,000, representing a little better than one dollar of every five Canada has earned to date from the sale of uranium.

The Government's original investment in acquiring ownership of Eldorado Mining and Refining Limited was \$9,246,877, from which it has derived a return of \$28,740,000 in dividends and redemption of shares. From 1944 to date the Company has paid in federal taxes, provincial royalties, and grants in lieu of municipal taxes, a total of \$27,000,000.

Eldorado has two wholly-owned subsidiaries, Northern Transportation Company Limited and Eldorado Aviation Limited.

History of Northern Transportation Co.

A common carrier was set up in 1931 under the name of Northern Waterways Limited to serve the Mackenzie River basin, and in 1933 extended into Bear River and Great Bear Lake. The company changed hands in 1934 and became Northern Transportation Company Limited. This was acquired in 1936 by Eldorado Gold Mines Limited, primarily to assure service to the Port Radium mine, but it continued to carry freight for the public. It was included in the assets of Eldorado taken over by the Crown corporation in 1944.

The wooden tug boats and barges bought at a cost of \$140,000 have given way to 25 Diesel-powered steel tugs and 98 steel barges which, together with shipyards, agency facilities and equipment, represent an investment of more than \$12,000,000.

Northern Transportation serves an area extending from railhead at Waterways, Alberta, to Tuktoyaktuk on the Arctic Coast, a distance of 1,700 miles, with an additional 1,100 miles of branch routes to the principal lakes, Athabaska, Great Slave and Great Bear. The Company also is the Government agency which supplies the Distant Early Warning radar stations in the Western Arctic, operating two 16,000-barrel tankers, three 325-foot landing vessels, and 12 lightering vessels. A large floating drydock at Tuktoyaktuk plays a part in servicing the Arctic fleet.

History of Eldorado Aviation

The remoteness of the Port Radium mine made air transportation essential from the earliest stages. In 1944 Eldorado acquired its own aircraft to assist in field exploration work and the movement of personnel, perishable goods and emergency supplies. The service was expanded and a regular schedule established with the inception of the Beaverlodge mine, and in 1953 the division was incorporated as a separate, wholly-owned subsidiary company, Eldorado Aviation Limited. It provides air service at cost for Eldorado and Northern Transportation Company Limited. In addition to the movement of personnel and supplies, the aircraft carry uranium concentrates out of Beaverlodge.

At present Eldorado Aviation operates two transport aircraft, a DC-3 and a DC-4, and has recently acquired two Bell G2 helicopters to replace its Sikorsky S-55 helicopter. These will be used in conjunction with the Arctic operations of Northern Transportation, as well as in servicing Eldorado's hydro plants.

From the formation of Eldorado Aviation in May, 1944, until the end of 1962, its aircraft had flown more than 12,400,000 miles, in excess of 63,000 flying hours, and had carried more than 66,000 tons of freight and 91,000 passengers.

Canada's Uranium Sales 1955-1962

to the United States Atomic Energy Commission and
the United Kingdom Atomic Energy Authority

POUNDS U_3O_8 SOLD

DOLLAR VALUE OF SALES

	<i>Industry Total</i>	<i>Eldorado</i>	<i>Other Producers</i>	<i>Total</i>
1955	2,030,767	\$ 23,687,582	\$ 1,190,547	\$ 24,878,129
1956	4,223,704	21,511,508	20,785,781	42,297,289
1957	12,152,916	26,554,646	98,985,240	125,539,886
1958	26,796,084	33,010,520	246,904,045	279,914,565
1959	30,996,065	29,998,052	295,330,230	325,328,282
1960	24,960,435	31,720,083	234,037,824	265,757,907
1961	19,270,884	24,786,036	177,544,698	202,330,734
1962	17,080,037	21,718,388	151,964,007	173,682,395
	137,510,892	\$212,986,815	\$1,226,742,372	\$1,439,729,187

What Uranium Has Meant to Canada

A glut of uranium on world markets has ended the most spectacular Canadian mining boom of the 20th Century to date. Sales by the industry in 1962 were only slightly more than half those of the peak year 1959. An upsurge in demand is expected in the late 1960's or early 1970's, but in the interim there will be years when annual production of uranium may be only eight or nine per cent of what it was at the crest of the boom.


Uranium has made an important contribution to national prosperity. For the eight years 1955-62 inclusive, it brought an average of \$180,000,000 annually into the Canadian economy from sales to the United States and the United Kingdom. By the time deliveries are completed under contracts now in effect, the total value of Canadian uranium sales will be close to \$1,750,000,000.

This enormous sum is being derived from a mineral that was almost unknown to most people as recently as 15 years ago. Some uranium had been mined in Canada pre-war. The only commercial demand was for certain uranium salts used to colour glass or ceramics. Impetus was given to uranium production when the Allies launched the Manhattan Project in 1942, but the boom did not begin until the early 1950's, when the United

States offered to buy for its preparedness programme all the uranium Canada could produce.

The offer spurred exploration and the development of ore deposits. By 1958 Canada had 18 producing mines and the value of uranium output topped that of all other metals mined in this country. The position was maintained in 1959, but since then uranium has dropped behind nickel, copper and iron. For the next few years it will have a relatively minor place in statistics of mineral production in Canada.

Eldorado, as a private company up to 1944 and as a Crown corporation since, has had a key role in the Canadian uranium story as a producer and as the operator of the nation's only uranium refinery. Since 1954 it also has been the Government's exclusive agent to administer contracts for other producers, as well as its own, for delivery of uranium to the United States Atomic Energy Commission and the United Kingdom Atomic Energy Authority. Sales on behalf of other producers in the period 1955-62 inclusive amounted to 117,046,000 pounds of U_3O_8 valued at \$1,226,742,000 which, with the addition of Eldorado's own sales, brought the grand totals at the end of 1962 to 137,511,000 pounds of uranium valued at \$1,439,729,000.



Uranium Products

Mill Grade Chemical Precipitate — $\text{Na}_2\text{U}_2\text{O}_7$ (Yellowcake)
 Natural Uranium Trioxide — UO_3 (Orange Oxide)
 Natural Uranium Dioxide — UO_2 (Ceramic Grade)
 Natural Uranium Dioxide — UO_2 (Standard Grade)
 Natural Uranium Tetrafluoride — UF_4 (Green Salt)
 Natural Uranium Metal — Direct Cast Ingots and Vacuum Cast Billets
 Natural Uranium Diuranate — $(\text{NH}_4)_2\text{U}_2\text{O}_7$ (Reactor Grade Powder)
 Natural Uranium Hexahydrate — $\text{NO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ (Reactor Grade Crystals)
 Depleted Uranium Metal — Wide range of castings to customer specifications
 Enriched Uranium — UO_2 (Ceramic Grade) from Customer's UF_6

Available on Special Order:

The following products are not produced as part of the regular production, but can be made available on short notice in reasonable quantities (up to 100 pounds):
 Uranium Peroxide — $\text{UO}_4 \cdot 2\text{H}_2\text{O}$ (Pale Yellow Crystals)
 Uranyl Fluoride — UO_2F_2 (Pale Yellow Crystals)
 Uranyl Acetate — $\text{UO}_2(\text{C}_2\text{H}_3\text{O}_2) \cdot 2\text{H}_2\text{O}$ (Yellow Crystals)
 Uranyl Chloride — $\text{UO}_2\text{Cl}_2 \cdot 2\text{H}_2\text{O}$ (Yellow Crystals)
 Uranyl Sulphate Trihydrate — $\text{UO}_2\text{SO}_4 \cdot 3\text{H}_2\text{O}$ (Yellow Green Crystals)

Available for Ceramic Colouring:

Uranium Trioxide — UO_3 (Orange)
 Uranium Dioxide — UO_2 (Brown)
 Uranyl Nitrate Hexahydrate — $\text{UO}_2(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ (Yellow-Green)
 Ceramic Yellow — Approx. $\text{Na}_2\text{U}_2\text{O}_7$ Plus sulphate
 Ceramic Orange — Approx. $\text{Na}_2\text{U}_2\text{O}_7$
 Ceramic Black — U_3O_8

Enquiries should be addressed to:

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